Chapter 16
Liver Imaging and Biotechnology

A1a. Develop standardized definitions, diagnostic criteria, and methodology for liver imaging. A workshop was sponsored by the NIH and the American Association for the Study of Liver Diseases (AASLD) at its annual meeting in November 2005 focusing on "Standardization of Nomenclature, Diagnostic, and Outcome Criteria in Liver and Biliary Diseases." (0%)

A1b. Better define the role, efficacy, and safety of image-guided local therapies for HCC, such as radiofrequency and thermal ablation. A multi-center feasibility study of percutaneous radiofrequency ablation of hepatocellular carcinoma in cirrhotic patients was funded by the NIH through the American College of Radiology Imaging Network, and patient enrollment will begin in the near future. (10%)

A2a. Create a liver tissue bank with correlative imaging data to facilitate clinical research. Liver tissue is collected in several NIH-funded tissue bank efforts, including an effort dedicated to proteomics and biomarkers for hepatocellular carcinoma. Further integration of tissue with imaging results is needed. (10%)

A2b. Develop improved techniques for established imaging methods for liver disease, such as optical, MRI, or PET/CT scanning. Many NIH-funded investigator-initiated research (R01) grants are supported in this area, including efforts in contrast enhanced ultrasound, novel MRI contrast agent for monitoring thermal ablation, novel radial MRI techniques, and multifunctional low-density lipoprotein nanoplatforms. (20%)

A3. Evaluate molecular imaging techniques in animal models of liver disease. Continued funding of multiple *In vivo* Cellular and Molecular Imaging Centers (ICMICs) and Small Animal Imaging Resource Programs (SAIRPs) by the NIH has contributed to this goal. The NIH has also funded individual R01 grants in this area, including a study of quantitative FDG-PET for imaging woodchuck HCC at Case Western Reserve University. (10%)

B1a. Validate standardized definitions, diagnostic criteria, and methodology for liver imaging in prospectively studied patients with liver disease. This goal will follow the development of definitions and diagnostic criteria (goal A1a). (0%)

B1b. Extend studies on validation to international populations. This goal will follow the development of definitions and diagnostic criteria (goal A1a). (0%)

B2. Develop bioinformatics such that computer-aided diagnostics are useful in evaluation of liver disease. Many bioinformatics efforts were funded by the NIH in 2005 including the NIH Roadmap Bioinformatics and Computational Biology initiative. Evaluation of liver disease can benefit from these non-disease specific initiatives. (10%)

B3. Apply promising molecular imaging techniques to human liver diseases or processes using antibody, receptor ligand, metabolically active, or substrate-

defining probes. Molecular imaging techniques is the focus of several NIH-funded, investigator-initiated R01 grants. (0%)

C1a. Apply definitions, criteria, and methodology for liver imaging as surrogate endpoints to therapy of liver diseases. This goal will follow development of definitions and diagnostic criteria (goal A1a). (0%)

C1b. Develop practical means of assessing liver (fat content, fibrosis, inflammation, functionality) for population-based studies. The NIH sponsored a workshop on imaging of renal and liver fibrosis in 2005 in an effort to prompt research in this area. (0%)

C2. Develop imaging techniques that are fully integrated into therapy of liver disease. This area is a focus of several R01 grants, including one on the development of a 3D time-resolved tomographic interventional platform at the University of Wisconsin-Madison. (10%)

C3. Develop molecular imaging methods that provide individualized information for monitoring and therapy of liver disease, including pharmacokinetics and pharmacodynamics of targeted therapies. Molecular imaging techniques is the focus of several NIH-funded, investigator-initiated R01 grants. (0%)

Figure 18. Estimated Progress on Liver Imaging and Biotechnology Research Goals, 2005 (Year 1)